



NetLink e340/i640 Wireless Telephone
Cisco CallManager and IP Phone 7960 Emulation
Configuration and Administration

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1. About This Document

This document explains how to configure and maintain the NetLink e340/i640 Wireless Telephone within Cisco IP telephony systems that employ CallManager, CallManager ITS, CallManager SRST, versions 3.x and 4.1; and CCME (Call Manager Express) version 3.2. The instructions in this document are for SpectraLink Software Version: 91.040 and higher.

1.1 Referenced Documents

SpectraLink 8000 SVP Server: Administration Guide for Mitel and Cisco (1725-36031-001)

Available at http://www.polycom.com/usa/en/support/voice/wi-fi/spectralink_8000_svp_server.html

Polycom WLAN Compatibility Table (1725-36040-001)

Access Point Configuration Guide (1725-36xxx-001 where xxx indicates a number corresponding to the type of access point.)

Available at http://www.polycom.com/usa/en/support/voice/wi-fi/wi-fi_interoperability.html

Deploying Enterprise-Grade Wi-Fi Telephony white paper.

Available at

http://www.polycom.com/common/documents/products/voice/mobile/bestpractices_SLNK_032708.pdf

Open Application Interface (OAI) Specification (72-0052-00)

Available by request from SpectraLink Customer Service.

1.2 Customer Support Hotline

SpectraLink wants you to have a successful installation. If you have questions please contact the Customer Support Hotline at (800) 775-5330. The hotline is open Monday through Friday, 6 a.m. to 6 p.m. Mountain time.

For Technical Support: technicalsupport@polycom.com

For Knowledge Base: <http://www.polycom.com/usa/en/support/voice/voice.html>

1.3 Icons and Conventions

This manual uses the following icons and conventions.



Caution! Follow these instructions carefully to avoid danger.



Note these instructions carefully.

NORM

This typeface indicates a key, label, or button on the NetLink Wireless Telephone.

2. NetLink Wireless Telephone Overview

The NetLink e340/i640 Wireless Telephone is a mobile handset for workplace IP telephone systems. The handset operates over an 802.11b wireless Ethernet LAN providing users a wireless voice over IP (VoIP) extension. By seamlessly integrating with the Cisco CallManager, handset users are provided with high-quality mobile voice communications throughout the workplace. The handset gives users the freedom to roam throughout the workplace while providing all the features and functionality of an IP desk phone.

The NetLink e340/i640 Wireless Telephone provides a wireless extension to Cisco CallManager v3.08 and later. The NetLink e340/i640 Wireless Telephone supports the Skinny Client Control Protocol (SCCP). “Skinny” is an open protocol developed by Cisco Systems for communication between an IP phone and the CallManager call processing application. The handset can also be registered to other platforms supporting SCCP, such as CallManager Express (CME) and Cisco SRST.

The handsets reside on the wireless LAN with other wireless devices using Direct Sequence Spread Spectrum (DSSS) radio technology. The handset radio transmits and receives packets at up to 11Mb/s.

A CallManager template for the handset must be configured for the specific features and lines to be accessed by the handset. The handset can be automatically added to the network and registered with CallManager, or each of these steps can be configured manually. After the handset is registered it receives its configuration information from CallManager.

2.1 QoS and Security

The NetLink SVP Server is an Ethernet LAN device that works with the access points (APs) to provide QoS on the wireless LAN. Voice packets to and from the NetLink Wireless Telephones are intercepted by the NetLink SVP Server and encapsulated for prioritization as they are routed to and from an IP telephony server or gateway. See the *SpectraLink 8000 SVP Server: Administration Guide for Mitel and Cisco* document for detailed information about this device.

The NetLink e340/i640 Wireless Telephone supports Wired Equivalent Privacy (WEP) as defined by the 802.11 specification. SpectraLink offers the product with both 40-bit and 128-bit encryption.

NetLink Wireless Telephones support basic WMM™ (Wi-Fi Multimedia) if also supported by the AP as part of the 802.11e protocol. If the AP supports WMM, the handset automatically discovers and uses it. WMM does not replace the NetLink SVP Server as described in the following paragraph. WMM settings must be configured on the SVP Server.

NetLink Wireless Telephones also support the 802.11i protocol including Wi-Fi Protected Access (WPA™ and WPA2™)—PSK. As vendors introduce APs that are eligible to become Wi-Fi CERTIFIED™ for WPA-PSK and/or WPA2-PSK, SpectraLink will determine their compatibility with the NetLink Wireless Telephones and include them on the *Polycom WLAN Compatibility Table*.



The latest software versions are required to support the features described in this document.

2.2 Quick Start Guide

1. A wireless LAN must be properly configured and operational through the use of 802.11b wireless APs.
2. A TFTP server must be available on the network in order to load the appropriate software into the handsets. Most installations choose to take advantage of the TFTP server that accompanies the CallManager, making a separate TFTP server unnecessary. See Section 5 *License Management* for detailed instructions for loading software on handsets.
3. Cisco's CallManager (Release 3.08 or greater) must be connected to your network and completely operational.
4. The NetLink SVP Server, which facilitates the QoS on the wireless LAN for the handsets, must be on the same subnet as the handsets and have the proper versions of software.
5. Visit <http://www.polycom.com/usa/en/support/voice/wi-fi/wi-fi.html> to download the latest NetLink Wireless Telephone and SVP Server software.
6. Download software: Download the correct NetLink Wireless Telephone software per Section 4.2 *Configuration Process*. Ensure the software is properly loaded on the TFTP server.
7. Download updates to the NetLink SVP Server software per *SpectraLink 8000 SVP Server: Administration Guide for SRP* Chapter 5, section on *Software Updates*.
8. Configure your handset to ensure that it associates with the Wireless LAN, has the appropriate software and is registered to CallManager. See Section 5 *License Management* for detailed instructions for loading software onto handsets.

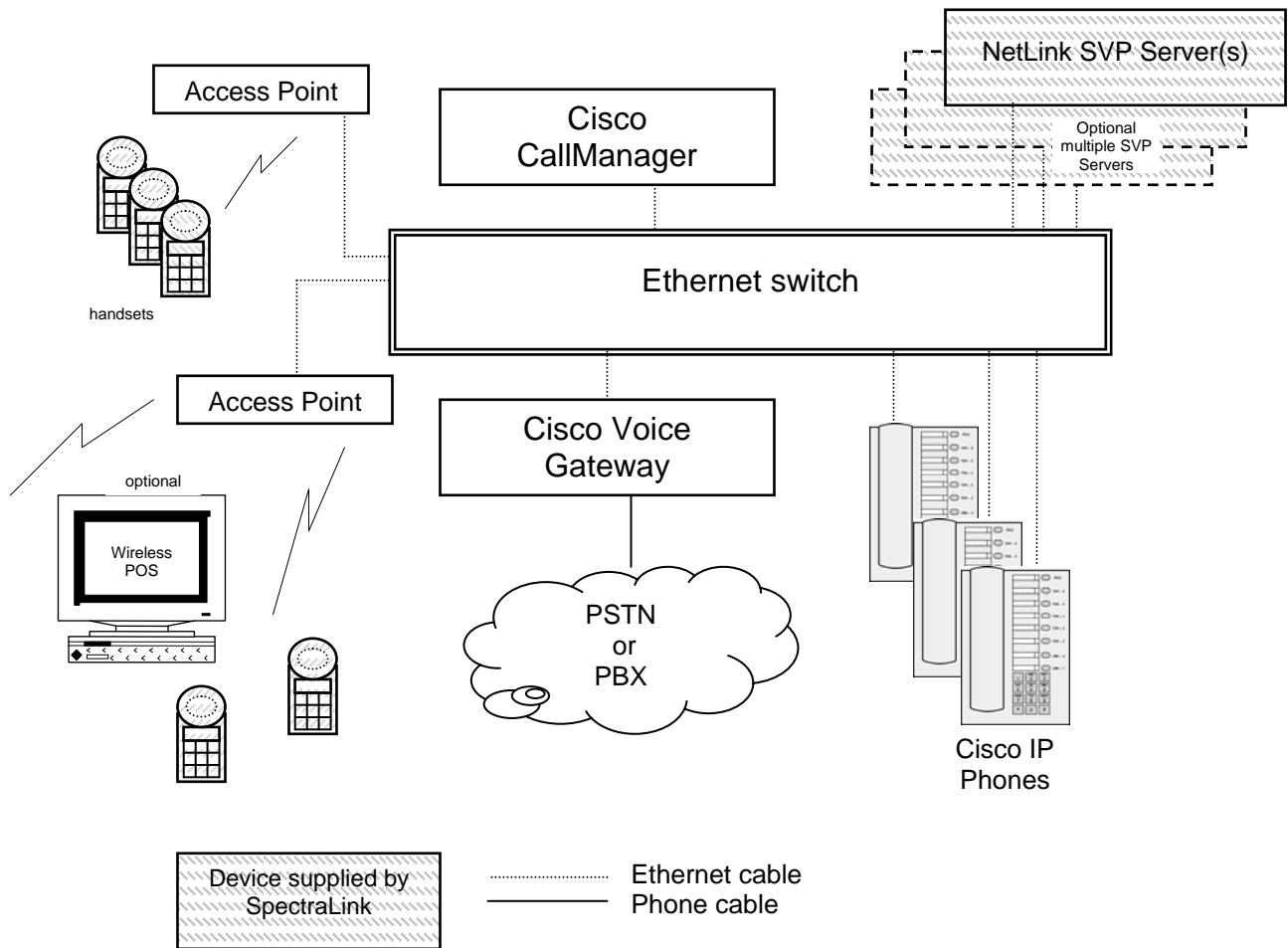


IP multicast addresses are used by the NetLink i640 Wireless Telephone system. This requires that multicasting be enabled on the subnet used for the NetLink Wireless Telephones and SVP Server.

Routers are typically configured with filters to prevent multicast traffic from flowing outside of specific domains. The wireless LAN can be placed on a separate VLAN or subnet to reduce the effects of broadcast and multicast traffic from devices in other network segments.

2.3 System Diagram

The following diagram shows the SpectraLink components residing on a network with Cisco CallManager, APs, and wireless LAN Ethernet Switched Hub:



2.4 System Components

NetLink e340 Wireless Telephone The NetLink e340 Wireless Telephone is a lightweight, durable handset specifically designed for mobile workplace use within a facility using the Cisco CallManager and 802.11b APs in a wireless LAN.

NetLink i640 Wireless Telephone The NetLink i640 Wireless Telephone offers a durable design with push-to-talk functionality.

Handset functionality is provided by emulating the Cisco IP Phone 7960. Using SCCP, the handset supports the 6 line/speed-dial buttons and softkeys. Among other features, the handset can receive calls directly, receive transferred calls, transfer calls to other extensions, initiate conference calls, and make outside and long distance calls (subject to the restrictions applied in your facility.) The handsets are to be used on-premises; they are not cellular or satellite phones.

NetLink e340/i640 Wireless Telephones use Direct Sequence Spread Spectrum radio technology (DSSS) to transmit audio packets over wireless LAN APs that support SpectraLink Voice Priority (SVP).

NetLink SVP Server SpectraLink Voice Priority (SVP) is the SpectraLink quality of service (QoS) mechanism that is implemented in the handset and AP to enhance voice quality over the wireless network. SVP gives preference to voice packets over data packets on the wireless medium, increasing the probability that all voice packets are transmitted efficiently and with minimum or no delay. SVP is fully compatible with the IEEE 802.11b standards.

The NetLink SVP Server is an Ethernet LAN appliance that works with the AP to provide QoS on the wireless LAN. All SCCP packets to and from the NetLink e340/i640 Wireless Telephones pass through the NetLink SVP Server and are encapsulated for prioritization as they are routed to and from the CallManager or other telephone.

CallManager The software-based call-processing component of the Cisco IP telephony solution.

Access points (APs) are supplied by third party vendors and provide the connection between the wired Ethernet LAN and the wireless (802.11b) LAN. APs must be positioned in all areas where NetLink Wireless Telephones will be used. The number and placement of APs will affect the coverage area and capacity of the wireless system. Typically, the requirements for use of NetLink e340/i640 Wireless Telephones are similar to that of wireless data devices.

APs must utilize SpectraLink Voice Priority (SVP). Contact SpectraLink, or a certified SpectraLink distributor, for information about APs that support SVP.

Ethernet switch Interconnects multiple network devices, including the NetLink SVP Server, the CallManager, Cisco IP Phones and the APs. Ethernet switches provide the highest performance networks, which can handle combined voice and data traffic, and are required when using the NetLink e340/i640 Wireless Telephones.

Although a single Ethernet switch network is recommended, the handsets and the NetLink SVP Server can operate in larger, more complex networks, including

networks with multiple Ethernet switches, routers, VLANs, and/or multiple subnets, as long as the SVP Server and APs are on the same subnet. However, in such networks, it is possible for the QoS features of the NetLink SVP Server to be compromised, and voice quality may suffer. Any network that consists of more than a single Ethernet switch should be thoroughly tested to ensure any quality issues are detected.

Note that the NetLink e340/i640 Wireless Telephones cannot actively roam from one subnet to another. If routers and multiple subnets are in use, the NetLink Wireless Telephones must only use APs attached to a single subnet, or be powered off and back on to switch to a different subnet.

Cisco IP Phone The wired LAN desksets provided by Cisco for use with the CallManager.

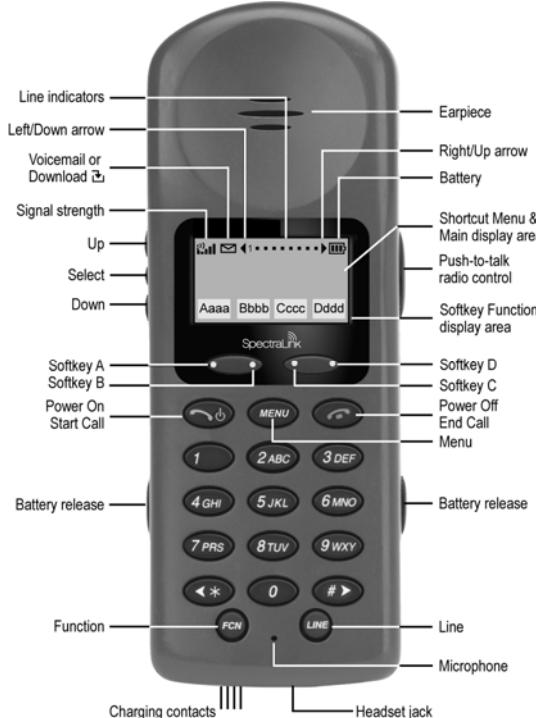
Cisco Voice Gateway A wired-LAN component that provides access to telephony resources outside the CallManager and the IP Network. Voice Gateways can connect to the Public Telephone Network or to certain PBXs. Contact Cisco for more information about available Voice Gateways.

TFTP server Required in the system to distribute software to the handsets. May be on a different subnet than the CallManager and APs.

3. The NetLink Wireless Telephone



NetLink e340 Wireless Telephone



NetLink i640 Wireless Telephone

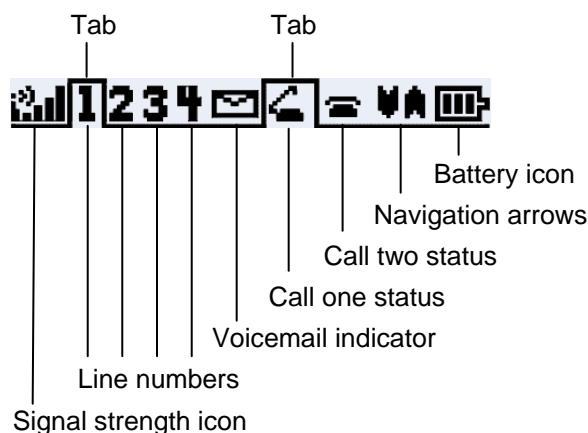
3.1 Specifications

Radio frequency:	2.4000 – 2.4835 GHz
Transmission type:	Direct Sequence Spread Spectrum (DSSS)
Transmit data rate:	Up to 11 Mb/s
Radio QoS:	SpectraLink Voice Priority (SVP), WMM
Wireless security:	Wired Equivalent Privacy (WEP), 40-bit and 128-bit, Cisco FSR; WPA-PSK, WPA2-PSK
FCC certification:	Part 15.247
Management:	DHCP, TFTP
Voice encoding:	G.711 (A- and mu-law), G.729a/ab
VoIP Protocols:	Skinnny Client control Protocol (SCCP)
Transmit power:	100 mW peak, < 10 mW average (US/NA)
Display:	Pixel-based (up to 4-line x 18-character) alphanumeric, plus line and status indicators.
e340 dimensions:	5.5" x 2.0" x 0.9" (14.0 x 5.1 x 2.3 cm)
i640 dimensions:	5.9" x 2.2" x 1.0" (15.0 x 5.6 x 2.5 cm)
e340 weight:	4.2 ounces (119.0 g)
i640 weight:	6.0 ounces (170.1 g)
Battery capacity:	4 hours talk time, 80 hours standby (30 hours standby if push to talk (PTT) is enabled)

3.2 The Handset Display

Icons

The top row of the handset display in the Cisco SCCP implementation is customized to provide four line appearances with two calls on each. The top row icons and their positions are shown below:



Signal strength

The signal strength icon indicates the strength of the signal from the AP and can assist the user in determining if the handset is moving out of range. It is always present on the display in the upper left corner.

Line indicators

The four line numbers indicate activity on each of the four possible line appearances. The first tab indicates the active line and the second tab indicates its status.

Voicemail

The voicemail icon is activated when a new voicemail message is received if the feature is supported by the phone emulation. It appears to the right of the signal strength icon.

Download

The download icon indicates that the handset is downloading code. This icon only appears while the handset is running the over-the-air downloader. It appears in the same location as the voicemail icon.

Call status

The call status icons indicate the type of activity occurring on the first and second call on the tabbed line.

Navigation arrows

The navigation arrow icons indicate up and down or left and right scrolling options. Scroll through the display by pressing the **Up** and **Down** buttons on the left side of the handset.

Battery charge

The battery icon indicates the amount of charge remaining in the Battery Pack. There are three levels and when only one level remains, the Battery Pack needs to be charged. It is always present on the display in the upper right corner.

Alphanumeric text

The NetLink e340/i640 Wireless Telephone supports a two to four line display of up to 19 alphanumeric characters. Display information provided by the Cisco CallManager when the handset is off-hook will be passed directly to the handset display. The handset will display only the first 16 characters of each line. Certain characters may be used by the Cisco CallManager that are not implemented in the handset such as definable and special characters. See the *Feature Programming* section for an explanation of displayed features.

Press the **FCN** key while off hook to scroll through features and emulated keys. Press the **LINE** key while off hook to scroll through the line/memory keys.

Softkey display area

When the handset is active, the bottom row displays up to four softkey feature abbreviations. The full text may be viewed by pressing the **MENU** key. Press the corresponding softkey to activate the feature.

Ringing and tones

The ringing types are programmed by the handset user into the handset and are not accessible or changeable by the CallManager. When **Ring Cadence** is set to PBX and whenever possible, the audible and vibrating ringer on the handset will follow the SCCP protocol cadence commands provided by the Cisco CallManager. See the *User Preferences* section.

Audio features

The Cisco IP Phone 7960 speakerphone features are not available on the handset.

3.3 Startup Sequence

The handset goes through an initialization sequence at startup. The line icons 1-9 display and count down as the handset steps through this sequence. This is usually very rapid. If there is any difficulty at any step that prevents initialization from continuing, an error message will display and the related icon(s) will stay on. Please see the error table at the back of this document for instructions on how to handle error messages that occur during initialization.

Icon	The icon(s) shown in bold turns off when:
123456789	The handset has located and authenticated and associated with at least one AP, and is proceeding to bring up higher-layer networking functions.
12345678	The handset is either configured for Static IP, or if configured for DHCP the DHCP discovery process has started.
1234567	If DHCP is configured, a DHCP response was received which contains a good DNS server configuration.
123456	Note: Only valid on non-SRP protocol. Indicates one of the following: Static IP configuration, or SVP Server address found in DHCP response, or SVP Server address found via DNS lookup.
12345	All networking functions are complete (notably, DHCP) and the handset is proceeding with establishing the SRP link to the SVP Server.
1234	The SRP link is established, all network stack initialization is complete, proceeding with application-specific initialization.
123	The link between the handset and the TFTP server is established. The handset displays Trying TFTP [n] . [n] is the retry count.
12	The handset has opened a connection to the CallManager. The handset displays Opening .
1	The handset has registered to the CallManager. The handset displays Registering [n] . [n] is the progress down counter while performing the registration. The start number depends on the CallManager version.
(no icons) EXT. XXXX	Initialization is complete. The handset is in standby mode ready to receive and place calls.

3.4 Handset Modes

Standby (on-hook)

In the standby mode the handset is waiting for an incoming call or for the user to place an outgoing call. The extension number is shown on the display and there is no dial tone. In this mode, the handset is conserving battery power and wireless LAN bandwidth.

When an incoming call occurs the handset will ring until the call is answered by pressing the **Start Call** key or the **End Call** key is pressed to silence the ringing.

Active (on hook)

Press the **MENU** key in standby mode to emulate the on-hook state of the IP Phone 7960.

Active (off-hook) predial

To place a call using predialing (cell phone dialing), dial the number while in standby mode and then press **Start Call**. This transitions the handset to active off-hook mode and the number is immediately called.

Active (off hook)

To place a call, press the **Start Call** key. This transitions the handset to active off-hook mode. There is a dial tone, the handset is in communication with the PBX, and the display shows information as it is received from the PBX. The user may place a call or press the **FCN**, **MENU** or **LINE** key to access operations.

The handset is also in the active mode when a call is received.

When an incoming call occurs during an active call the handset will play the second line ringing sound until the call is answered, the caller hangs up, or the call transfers to voicemail. If **End Call** is pressed, the first call is terminated and the handset reverts to a full ring.

The active modes utilize the most bandwidth and battery power. To conserve these resources, return the handset to the standby mode when a call is completed by pressing the **End Call** key.

3.5 NetLink Wireless Telephone Displays

Status display area

When active, the handset displays a row of line icons at the top of the screen. There are four rows available for text display and a bottom row that displays softkey abbreviations. Information from the PBX is shown on the text row above the softkeys. Note that PBX text that would normally be displayed on the Cisco IP Phone 7960 may be truncated to 16 to 19 characters on the handset. <Muted> is displayed on the second text row when local muting is activated.

LINE display

Pressing the **LINE** key from the active mode displays a list of line appearances extracted from the programmable keys list. The line appearances are also mapped to corresponding line icons.

MENU display

Pressing the **MENU** key from the active state displays an expanded description of the softkey features. If configured, pressing **MENU** in an active state will display the diagnostic menus.

Pressing the **MENU** key from the standby state takes you into active on-hook mode.

FCN display

Pressing the **FCN** key from the active mode displays the Mute, Voicemail, OAI functions and the speed dial list.

4. NetLink Wireless Telephone Configuration

Each handset may be configured for site-specific requirements by opening the Admin menu and selecting options or entering specific information. Any settings entered in the Admin menu must conform to system settings. Only the handset being configured is affected by the Admin menu settings.

The NetLink e340/i640 Wireless Telephones can be automatically registered at first turn on. The handset can be automatically configured for IP Address, ESSID and/or CallManager by enabling DHCP, ESSID Learning, and automatic registration (at CallManager), respectively.

The handset user may select several usability options from the Standby menu, described below in the *User-defined Preferences* section. This information is also provided in the end-user manual.

The NetLink Configuration Cradle is an accessory device designed to automate configuration of e340 and i640 models of the NetLink Wireless Telephone. The Configuration Cradle is connected to a PC via a serial cable. A downloadable Configuration Cradle program runs on the PC and enables the system administrator to establish and store configuration options for system, group and user levels. A configuration plan may be set up in the program and downloaded into a handset or a configured handset may be placed in the cradle and its configuration may be uploaded and edited or saved.

Please see your service representative or contact SpectraLink Customer Service for more information about this time-saving device

4.1 The Admin Menu

The Admin menu contains configuration options that are stored locally (on each handset). Every handset is independent; if the default settings are not desired, the Admin options must be set in each handset requiring different settings.

Opening the Admin menu

1. With the handset powered OFF, simultaneously press and hold the **Power On** and **Power Off** keys.
2. Release the **Power On** key, wait for a single beep, then release the **Power Off** key. The Admin menu displays.



If an Admin password has been set, the display will require its entry before opening the Admin menu. If no password is set, the display will proceed directly into the Admin menu.

Entering and editing Admin menu options

An asterisk (*) next to an option indicates that it is selected. Use the **Up**, **Down**, and **Select** side buttons and the softkeys to navigate and select:

- Up/Down buttons:** Display previous/next menu item.
- Select button:** Selects the menu item or option.
- OK softkey:** Selects the menu item or option.
- Save softkey:** Saves the entry.
- Bksp softkey:** Backspaces to allow editing of entry.
- Cncl softkey:** Cancels edit and returns to previous menu level.
- Up softkey:** Returns to previous menu level.
- Exit softkey:** Exits the menu (at the top level).
- End Call key:** Exits to standby state (from any level)

Alphanumeric string entry

1. Press the first digit/letter. The digit displays. Press the key again to scroll through the letters associated with that key.

Example: if you press 2 repeatedly, you will see 2, A, B, and C, a, b, and c.

The following table shows which key will allow you to enter non-numeric characters or other characters not represented on the keypad.

To Enter	Press
. - _ ! # \$ % & ' () * + , ; / \ = @ ~	1
Space	0
Q,q	7
Z,z	9

2. When the correct entry displays, press the Right Arrow key to move on to the next character. Repeat for each digit/letter of the entry. To erase, press the Left Arrow key or **Bksp** softkey to erase the previous character.
3. Press the **Save** softkey to save the entry and return to the menu.
Press the **Cncl** softkey to abort and return to the menu without saving any changes.

The following table lists the Admin menu items. The default settings are shown in the table below with an * prior to the option. Detailed descriptions of each item appear below the table.

Admin menu

Admin Menu Items	2 nd Level	3 rd Level	4 th Level	5 th Level
Phone Config	License Option	Set Current	[List per download]	
	Push-to-talk	Allowed Channels	*Channel 1 *Channel 2 *Channel 3 *Channel 4 *Channel 5 *Channel 6 *Channel 7 *Channel 8	
		Allow/Disallow	*Allow PTT Disallow PTT	
	Admin Password	Enter PW	Re-enter Password	
Network Config	IP Addresses	*Use DHCP		
		Static IP	Phone IP Default Gateway Subnet Mask Syslog Server IP Cisco TFTP Server IP SVP Server IP OAI Server IP	
	ESS ID	*Learn Once Learn Always Static Entry		
	Security	*None		
		WEP	Authentication WEP On/Off Key Information Rotation Secret	Open System Shared Key Default Key Key Length Key 1-4
		Cisco FSR	Username Password	
		WPA-PSK	Passphrase Direct Entry	
		WPA2-PSK	Passphrase Direct Entry	
	Reg. Domain: xx			
	Transmit Power	*Maximum 50 mW † 30 mW † 20 mW 15 mW 10 mW 5 mW		
	OAI on/off	Enable OAI Disable OAI		

Admin Menu Items	2 nd Level	3 rd Level	4 th Level	5 th Level
Diagnostics	Run Site Survey			
	Diagnostics Mode	Diagnostics On *Diagnostics Off		
	Syslog Mode	*Disabled Errors Events Full		
	Restore Defaults			

* default setting

† 50 mW and 30 mW only appear if Regulatory Domain is set to None or 01.

Phone Config

License Option

License Option lets you select the VoIP protocol that your site is licensed to download and run. The SCCP protocol to use for the handsets is **008**. Any other protocol will cause the handset to malfunction.

Push-to-talk

All eight push-to-talk channels are allowed by default. To toggle the allowed status of any channel, select **Allowed Channels**, scroll to the channel to be disallowed and press the **Select** side button. Allowed channels are displayed with an * in the left column. Only those channels allowed in the Admin menu will appear on the Standby menu where they can be enabled or disabled by the end user. To disallow push-to-talk entirely, select **Allow/Disallow**, scroll to and select **Disallow PTT**.

Admin Password

The Admin Password controls access to the administration functions in the Admin menu. The password must be set in each handset for which controlled access is desired. Handsets are shipped without any Admin menu password. Data entry for the password uses the alphanumeric string entry technique. Type the password and press the **Save** softkey. A confirmation prompt will appear. Type the password again and press the **Save** softkey. If the passwords match, the Admin password has been set.



If you **Save** with no entry, the password is erased and the display will not require it before displaying the Admin menu.

Network Config

IP Addresses

There are two modes in which the handset can operate: DHCP enabled or Static IP. Select the mode from the IP address menu:

*** Use DHCP** Will use Dynamic Host Configuration Protocol to assign an IP address each time the handset is turned on. If DHCP is enabled, the handset also receives all other IP address configurations from the DHCP server.

Static IP Allows you to manually set a fixed IP address. If selected, the handset will prompt for the IP addresses of each configurable network component. When entering addresses, enter the digits only, including leading zeroes. No periods are required.

Regardless of the mode in which the handset is operating, the following components must be configured in the system:

Phone IP The IP address of the handset. This is automatically assigned if DHCP is used. If using Static IP configuration, you must obtain a unique IP address for each phone from your network administrator.

Default Gateway and Subnet Mask Used to identify subnets, when using a complex network which includes routers. Both of these must be configured either with an IP address under Static IP (not set to 000.000.000.000 or 255.255.255.255) or with DHCP for the handset to contact any network components on a different subnet. If configured on the DHCP server, use option 3 for the Default Gateway and option 1 for the Subnet Mask. Contact your network administrator for the proper settings for your network.



Note that the handsets cannot “roam” across subnets, since they cannot change their IP address while operational. Ensure that all your APs are attached to the same subnet for proper operation. The handset can change subnets if DHCP is enabled and the handset is powered off then back on when within range of APs on the new subnet.

Syslog Server IP The IP address of the syslog server. See the *Diagnostics* section for more information.

Cisco TFTP Server IP The IP address of the TFTP server which holds the CallManager-created configuration files. If using Static IP configuration, this is simply the IP Address of the appropriate TFTP server (often this is the CallManager system). Note that the TFTP server must be statically configured to have a permanent IP Address. If DHCP is being used, the handset will try the following, in order: DHCP option 150 (Cisco TFTP server), then 66 (TFTP server), then a DNS lookup of “CISCOCM1” if the DHCP options 6 (DNS server) and 15 (Domain Name) are configured.

SVP Server IP The IP address of the NetLink SVP Server. If using Static IP configuration, this is simply the IP address of the NetLink SVP Server. Note that the NetLink SVP Server must be statically configured to have a permanent IP address. If DHCP is being used, the handset will try the following, in order: the DHCP option 151, then a DNS lookup of “SLNKSVP2” if the DHCP options 6 (DNS server) and 15 (Domain Name) are configured.

OAI Server IP The IP address of the SpectraLink OAI Gateway (if applicable). If using Static IP configuration, this is simply the IP address of the SpectraLink OAI Gateway. If DHCP is being used, the handset will try the DHCP option 152.

ESSID

Select the option that will enable the handset to acquire APs with the correct ESSID (Extended Service Set ID, aka SSID) each time it is turned on.

Note about Automatic Learn options: Broadcast ESSID must be enabled in the APs for ESSID learning to function. Refer to the *Configuration Guide* for your AP or call your AP vendor for specifics. Overlapping wireless systems complicate the use of ESSID learning as the handset in an overlapping area could receive conflicting signals. If this is the situation at your site, use Static Entry or Learn Once in an area without overlapping ESSIDs.

*** Learn Once** Allows the handset to scan all ESSIDs for a DHCP server and/or TFTP server. Once either is found, the handset retains the ESSID from whichever AP it associates with at that point. When overlapping wireless systems exist, the Learn Once feature allows the handset to use only the ESSID established at first learn at all subsequent power ons. This ESSID is retained by the handset until the ESSID option is reselected.

Learn Always Allows the handset to automatically learn the ESSID at each power on or loss of contact with the wireless LAN (out of range). This may be useful if the handset will be used at more than one site.

Static Entry If your APs do not accept broadcast ESSID or if there are overlapping wireless systems in use at the site, enter the correct ESSID manually.

Security

Security

*** NONE** disables any 802.11 encryption or security authentication mechanisms.



For WEP, WPA-PSK and WPA2 PSK set each of the following options to match exactly the settings in your APs.



Encryption codes display as they are entered. For security reasons codes will not display when a user returns to the Admin menu, Encryption options.

WEP (Wired Equivalent Privacy) is a wireless encryption protocol that encrypts data frames on the wireless medium allowing for greater security in the wireless network. If WEP is required at this site, you must configure each handset to correspond with the encryption protocol set up in the APs. Select the entries from the options below to enable the handset to acquire the system.

Authentication

Select either **Open System** or **Shared Key**.

WEP On/Off

Select either **WEP Off** or **WEP On**.

Key Information

Default Key Enter the key # specified for use by the handsets. This will be **1** through **4**.

Key Length Select either **40-bit** or **128-bit** depending on the key length specified for use at this location.

Key 1-4 Scroll to the key option that corresponds to the **Default Key** that was entered above. Enter the encryption key as a sequence of hexadecimal characters. (Use the **2** and **3** keys to access hexadecimal digits A-F, use the Right Arrow key to advance to the next digit, and the Left Arrow key to backspace.) For 40-bit keys you will need to enter 10 digits, for 128-bit keys you will need to enter 26 digits. The display will scroll as needed.

Rotation Secret This is used for proprietary WEP key rotation. Refer to your custom document if this feature is supported in your system.

Cisco FSR (Fast Secure Roaming) In order to provide the highest level of security without compromising voice quality on Cisco Aironet wireless LAN APs, SpectraLink and Cisco Systems have cooperated to implement the Fast Secure Roaming mechanism. FSR is designed to minimize call interruptions for NetLink handset users as they roam throughout a facility. Existing Aironet 350, 1100, and 1200 APs may require a firmware upgrade to support FSR. Cisco FSR requires advanced configuration of the Cisco APs in your site. See your Cisco representative for detailed documentation on configuring your APs and other required security services on your wired network. To configure Cisco FSR in your NetLink Wireless Telephone, you must enter a Radius Server username and password into each handset.

Username Enter a username that matches an entry on your Radius server. Usernames are alphanumeric strings, and can be entered using the alphanumeric string entry technique.

Password Enter the password that corresponds to this Username.

WPA-PSK The security features of WPA (Wi-Fi Protected Access) using PSK (Pre-Shared Key) are available and may be used if supported by the APs in the facility. Select either **Passphrase** and enter a passphrase between eight and 63 characters in length or **Direct Entry** and enter the 256-bit key code.

WPA2-PSK The security features of WPA2 (Wi-Fi Protected Access) using PSK (Pre-Shared Key) are available and may be used if supported by the APs in the facility. Select either **Passphrase** and enter a passphrase between eight and 63 characters in length or **Direct Entry** and enter the 256-bit key code.



Consult the *Configuration Guide* for the APs installed in your facility for information on which of the WPA versions are recommended by SpectraLink engineering. Configure the recommended version on the AP and select the corresponding option on the Admin menu.

Regulatory Domain

The Regulatory Domain will default to North America on the handset display. FCC requirements dictate that the menu for changing the domain be available by password, which in our case is the **LINE** key. To change the domain, press **LINE** and then enter the digits that represent the site's domain. Note that both digits must be entered.

01 - North America

02 - Europe (except Spain and France); Japan (channels 1-13)

04 - Spain

05 - France



As of this writing, Spain and France are adopting the general European Regulatory rules. Check with your wireless LAN administrator or supplier for which domain to enter in these countries.

Transmit Power

Available transmit power is regulated by domain. The Regulatory Domain setting above affects the options available for this setting. The default setting is **Maximum** which in North America is 100 mW. The Maximum in other domains is 30 mW. Transmit Power may be set to a lower number if necessary by selecting one of the other levels. If changed from the default, ensure the Transmit Power setting is the same on all handsets and all APs.

OAI On/Off

SpectraLink's Open Application Interface (OAI) enables third-party computer applications to display alphanumeric messages on the handset display and take input from the handset keypad. Refer to the *Open Application Interface (OAI) Specification* documentation for information about administering the OAI Gateway and the services it can provide.

If you have an OAI Gateway installed in your system, OAI may be optionally enabled in each handset. You may select whether the handset should attempt to connect to the SpectraLink OAI Gateway by choosing either the **Enable** or **Disable** options in this menu.

If OAI is enabled, and an OAI IP address is available to the handset (either via DHCP or Static IP configuration), the handset will communicate with the OAI Server at power on, and periodically while it is powered on. If you don't have a SpectraLink OAI Gateway installed at your site, you should disable the OAI feature to preserve network bandwidth and battery life.

Diagnostics

Run Site Survey

The Site Survey mode is activated by selecting this option. Site survey starts running immediately upon selecting this option. See the *Diagnostic Tools* section for more information about Site Survey.

Diagnostics Mode

See the *Diagnostic Tools* section for a detailed explanation of the Diagnostics Mode options.

Syslog Mode

See the *Diagnostic Tools* section for a detailed explanation of the Syslog Mode options.

Restore Defaults

The Restore Defaults option will set all user and administrative parameters except License Options to their factory defaults.

4.2 User-defined Preferences

The following user-defined preferences are also covered in the NetLink e340/i640 Wireless Telephone user guide. The system administrator can refer to this list for more information about customizing handset settings.

To configure the following options, the handset must acquire the system (no error message may display) and be at the extension display. This is the standby state. While in the standby state, press and hold **FCN** briefly to open the user options menu. Use the following keys to display and select options:

- Up/Down buttons:** Display previous/next menu item.
- Select button:** Selects the menu item or option.
- OK softkey:** Selects the menu item or option.
- Save softkey:** Saves the entry.
- Bksp softkey:** Backspaces to allow editing of entry.
- Cncl softkey:** Cancels edit and return to previous menu level.
- Up softkey:** Returns to previous menu level.
- Exit softkey:** Exits the menu (at the top level).
- End Call key:** Exits to standby state (from any level).

Standby menu

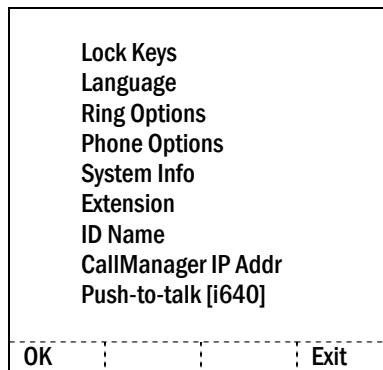
Standby menu item	2 nd Level	3 rd Level	4 th Level
Lock Keys			
Language	[List per download]		
Ring Options	Telephone Ring	Ring Cadence	Off *PBX Continuous Short Pulse Long Pulse
		Ring Tone	*Tone 1 Tone 2 Tone 3 Tone 4 Tone 5
		Ring Volume+	Bars
		Vibrate Cadence	*Off PBX Continuous Short Pulse Long Pulse
		Ring Delay**	*No Delay 5 Second Delay 10 Second Delay
	Auxiliary Ring 1		
	Auxiliary Ring 2		
Phone Options	Noise Mode	*Normal High Severe	
	Key Tones	*Enable Tones Disable Tones	
	Warning Tones	*Enable warnings Disable warnings	
	Display Contrast	Contrast %	
	Keypad Autolock	*Disable 5 seconds 10 seconds 20 seconds	
System Info	Phone IP Addr		
	Firmware Version		
Extension			
ID Name			
CallManager IP Addr			
Push-to-talk	Channel	Current Channel: X 1 2 3 4 5 6 7 8 New Channel = ?	
	Enable/Disable	PTT Enabled *PTT Disabled	
	Audio Volume	Bars	
	Tone Volume	Bars	

* Default setting

**Option appears when Ring Cadence and Vibrate Cadence are both set to a value other than "Off"

+These options are available only on the NetLink i640 Wireless Telephone

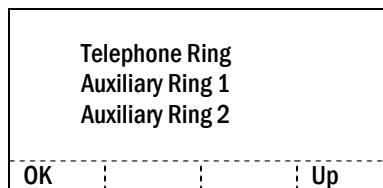
Main Menu Scroll through the list of options by pressing the **Up** and **Down** side buttons. Select an option by pressing the **Select** side button.



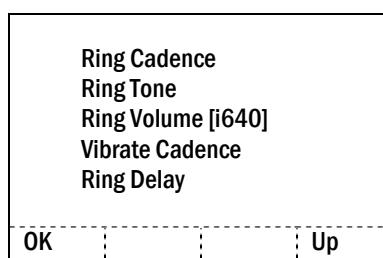
Lock Keys When enabled, the Keypad Lock option will lock the keypad immediately. If the keypad is locked, it may be unlocked by the end user pressing the **Unlk** softkey and then the **#** key.

Language If the system supports multiple languages, the language option will list what languages are available. Select the language from the list.

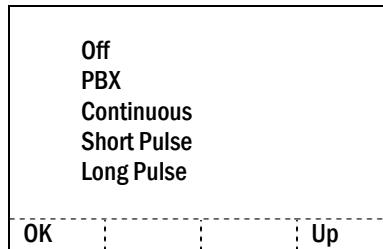
Ring Options The Ring Option allows the user to set the ring for three separate functions. Telephone ring is used for usual telephony functions. The Auxiliary Rings may be used to set different ringing patterns for OAI applications.



Telephone Ring Telephone Ring allows the user to set a distinctive ring style, volume and sequence. Select from an audible ring or a vibrate-only ring or a vibrate ring along with or followed by an audible ring.



Ring Cadence The cadence is the rhythm of the ring. It may be set to a pre-programmed ring cadence or it may be set to obtain its cadence from the Call Agent. The PBX option is designed to utilize any distinctive rings sent by the Call Agent while allowing the user to set unique rings for auxiliary applications.



Off: silent

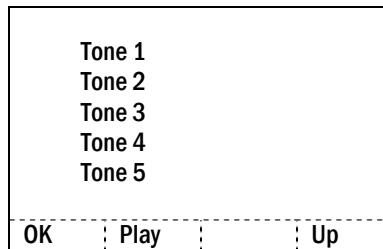
PBX: Call Agent determines ring cadence (e.g. the Call Agent may send rings that differentiate between internal and external calls.)

Continuous: rings continually until answered

Short Pulse: rings in short bursts

Long Pulse: rings in long bursts

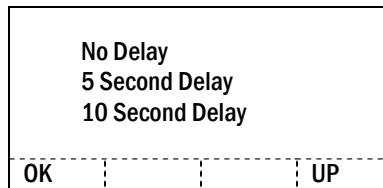
Ring Tone select from five available tones (scroll to Tone 5 option). The Play softkey allows the user to preview the tone before selecting. If Ring Cadence is turned off, the Ring Tone option will not appear on the menu.



Ring Volume (NetLink i640 Wireless Telephone only) The user may select a volume level by pressing the **Up** and **Down** side buttons and then pressing the **OK** softkey. The graduated volume bar indicates the levels. This setting may be overridden by adjusting volume while the handset is ringing.

Vibrate Cadence Vibrate Cadence options are the same as for Ring Cadence

Ring Delay Ring Delay determines how long the vibrate cadence will play before the audible ring starts. If Ring Cadence and Vibrate Cadence are turned off, the Ring Delay option will not appear on the menu.



Auxiliary Ring 1 and Ring 2 Auxiliary rings are designed to be utilized by OAI applications, enabling the user to set a distinctive ring for these applications.

Phone Options

Noise Mode Provides options that describe the noise level in your environment. Changing this mode to **High** or **Severe** adjusts the handset's microphone and in-ear speaker volume to account for background noise. Select **Normal** for most office environments; **High** for moderate background noise; or **Severe** for extremely noisy conditions. If you use **High** or **Severe** modes in a quiet environment, the person on the other end of the line may find it difficult to hear your voice.

Key Tones Key tones may be turned on or off and determine if tones play when keys are pressed. Key tones are enabled by default.

Warning Tones The handset plays various warning tones such as system up or down, out of range, etc. These tones may be turned on or off and are enabled by default.

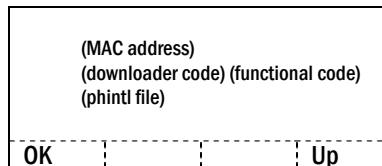
Display Contrast The display may need to be adjusted for different lighting situations. Contrast may be set by pressing the **Up** and **Down** side buttons until the desired contrast is displayed and then pressing the **OK** softkey.

Keypad Autolock The handset may be set to lock the keypad automatically when in standby mode. The automatic locking function of the keypad may be disabled (the default) or adjusted for a 5, 10 or 20 second delay before locking.

System Info

Phone IP Addr Displays the IP address currently assigned to the handset.

Firmware Version displays the software version running the handset. The MAC address is the hardware identification number and is set at the factory. Three code numbers correspond to the three files that each version uses.



Downloader: pd11gl3.bin
Functional: pd11skd3.bin
Phintl: pi110001.bin

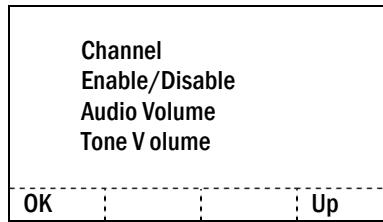
Extension Displays the extension currently assigned to the handset.

ID Name The ID Name permits an alphanumeric entry that will appear on the standby display under the extension number. The entry technique uses cell phone style entry where the key is pressed repeatedly to scroll through the characters for that key, starting with the letter characters. Enter up to 16 characters.

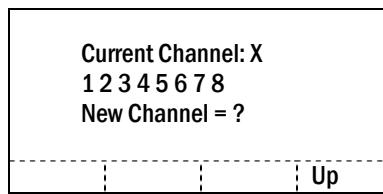
CallManager IP Addr This option displays the IP Address currently assigned to the CallManager.

Push-to-talk The NetLink i640 Wireless Telephone incorporates PTT functionality. PTT may be allowed or disallowed in the Admin menu. If allowed, the user may enable or disable locally, and may set the channel, tone volume and audio volume.

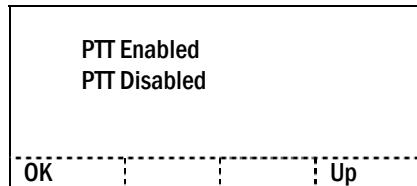
The menu for push-to-talk does not appear if PTT is disallowed on the Admin menu or if no channel is enabled on the Admin menu.



Channel The user may enable any PTT channel that has been allowed in the Admin menu by entering the corresponding number from the keypad. If PTT has been enabled in this handset, the default channel is the lowest allowed channel as set in the Admin menu.



Enable/Disable The user may enable or disable PTT on this handset. PTT is disabled by default.



Audio Volume, Tone Volume The user may select volume levels by pressing the **Up** and **Down** side buttons and then pressing the **OK** softkey. The graduated volume bar indicates the levels. The Audio Volume setting may be overridden by adjusting volume while the handset is in a push-to-talk call.



If PTT is allowed in the Admin menu and enabled by the user, Battery Pack life when the handset is in standby mode is decreased to about 30 hours.

(Additional options may be present. Contact your system administrator for information.)

5. License Management

NetLink Wireless Telephones support a number of different IP protocol integrations. All NetLink e340/i640 Wireless Telephones are shipped from SpectraLink with a generic software load that allows them to associate to a wireless LAN and download their functional software from a TFTP server. **The handsets will not function properly without downloading appropriate software.**

The following details the process to properly configure NetLink e340/i640 handsets and download software via over-the-air file transfer.

5.1 Requirements

- A wireless LAN must be properly configured and operational through the use of 802.11b wireless APs.
- Cisco's CallManager (Release 3.08 or greater) must also be connected to your network and completely operational.
- A TFTP server must be available on the network in order to load the appropriate software into the handsets. Most installations choose to take advantage of the TFTP server that accompanies the CallManager, making a separate TFTP server unnecessary.
- Finally, ensure that the Battery Pack on the handset is fully charged.

5.2 Configuration Process

1. Download the latest NetLink e340/i640 Wireless Telephone IP software from <http://www.polycom.com/usa/en/support/voice/wi-fi/wi-fi.html>. Scroll to **NetLink e340/i640 – Cisco; Cisco SCCP – 7960 emulation** and click the hyperlink to start the download.
2. Load the latest version of the SCCP code and place it on the TFTP server and ensure the TFTP server is started. The five files that are needed must be named:
slnk_cfg.cfg
pd11gl3.bin
pd11skd.bin
pd11skd3.bin
pi110001.bin
3. If statically assigning IP addresses, ensure that the Phone IP address, TFTP server IP, Subnet Mask, and Default Gateway information are accurate in the Admin menu. If using a DHCP server, ensure that appropriate options are set for the TFTP server. See the *NetLink Wireless Telephone Configuration* section for detailed configuration instructions.
4. Ensure the handset has properly configured ESSID and Reg Domain Information within the Admin menu. If you are accepting broadcast ESSIDs at your APs, the handset will automatically learn the ESSID information when powering on. See *NetLink Wireless Telephone Configuration* section for detailed configuration instructions.

5. Using the Admin menu on the handset, ensure the License Option menu option is set to **008**. This ensures the handset will check for the proper SCCP files each time it powers on. See *NetLink Wireless Telephone Configuration* section for detailed configuration instructions.
6. Ensure security settings are properly programmed. See section 3 *NetLink Wireless Telephone Configuration* for detailed configuration instructions.
7. Exit the Admin menu.
8. The SCCP code will now download to the handset. The status bar will increment fully across the display for each function that is being performed in the download process. Upon completion of the update process, the handset will reboot with the new firmware.
9. Register the handset with CallManager (if auto-register is not enabled) and properly label the handset with the appropriate extension.



For future software upgrades, simply update the files that are stored on the TFTP server. Each time the handset is powered up, it will check with the TFTP server to ensure it has the proper software version.

6. CallManager Integration Factors

This section describes the mapping between the emulated Cisco IP Phone 7960 and the NetLink e340/i640 Wireless Telephone.

Voice messaging access

Voicemail access is obtained through the message key which is accessed on the handset as **FCN** + a digit that corresponds to the assigned button on the CallManager template is identified as Voice Mail. See Section 7 *Feature Programming* for information on assigning feature buttons.

CODECs

The NetLink e340/i640 Wireless Telephone is compatible with the G.711 and G.729a/ab codecs. There is no setting required on the handset.

DHCP

Dynamic Host Configuration Protocol (DHCP) is a standardized protocol that enables clients to be dynamically assigned with various configuration parameters, such as an IP Address, subnet mask, default gateway, and other critical network configuration information. DHCP servers centrally manage such configuration data, and are configured by network administrators with settings that are appropriate for a given network environment. The handset will use the following DHCP options if DHCP use is enabled:

Option	Meaning
1	Subnet mask
3	Default gateway
6	DNS server
15	Domain name
66	TFTP server
150	Cisco TFTP server
151	NetLink SVP Server
152	NetLink OAI Gateway
siaddr	Boot server or next server

TFTP

All Cisco CallManager IP telephony clients receive their configuration information from the CallManager TFTP server. The NetLink e340/i640 Wireless Telephone matches this behavior, using TFTP to receive its configuration information from the CallManager. It can also use TFTP to update the handset software over the 802.11b wireless LAN.

DNS

Domain Name System (DNS), an industry-standard protocol, locates computers on an IP-based network. IP networks rely on number-based addresses to move information on the network. However, users are better at remembering friendly

names than number-based addresses, so, it is necessary to translate user-friendly names into addresses that the network can recognize. The handset will use DNS to automatically translate names into IP Addresses for these components: TFTP server, NetLink SVP Server, and the Cisco TFTP server.

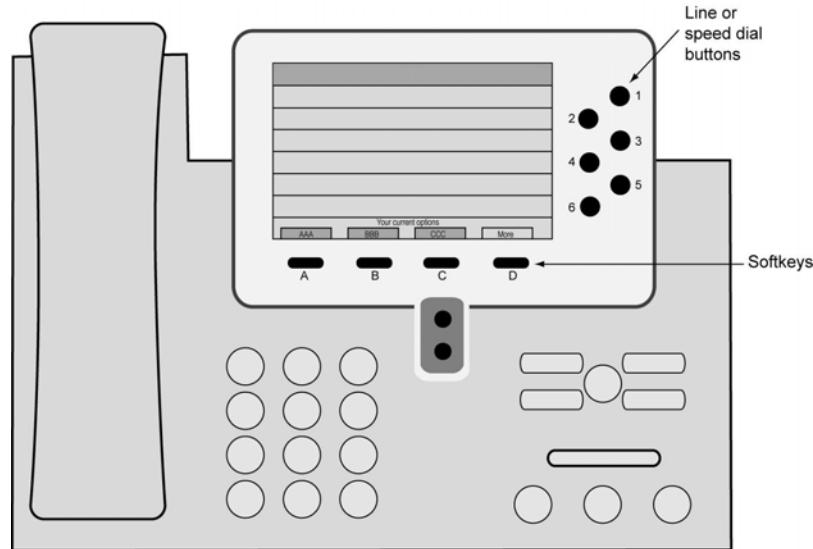
CallManager fail-over

Cisco recommends that CallManager be implemented in “clusters” that will load-balance as well as provide a fail-over mechanism. The NetLink e340/i640 Wireless Telephone has the ability to tolerate the failure of the CallManager it has registered with just as a Cisco IP Phone would.

SRST

The NetLink e340/i640 Wireless Telephone is compatible with SRST.

7. Feature Programming



The NetLink e340/i640 Wireless Telephone emulates the Cisco IP Phone 7960. All telephone functions and messaging features are supported if possible. Functions that require the use of the volume keys, speakerphone functions, and services settings are not supported.

The handset uses “shortcut keys” to emulate the feature keys on the 7960. Pressing **LINE**, **FCN**, or **MENU** plus a shortcut key will activate the assigned line appearance or feature.

In the standby mode, the handset has four display rows. The top row displays the signal strength icon, line numbers, a voicemail icon if there is a message waiting or a downloader icon if the handset is downloading code, call icons, arrow icons, and the battery icon. The second row displays the extension and identity of the handset as assigned by the CallManager. The third row displays identification information as set in the Standby menu. If the handset has been forwarded or is on hold, the third row will cycle through the ID, forwarding, and hold information. The bottom row displays the time and date as received from the CallManager.

7.1 Feature Assignment

In CallManager, Line keys 1-4 may be assigned to line appearances or to speed dial numbers. Line appearances are displayed on the handset in the Line Appearance List. Speed dial numbers are displayed in the Function List.

The Mute, Voicemail and OAI features are assigned to a function key sequence as described below. These features are displayed in the handset Function List.

All other features are assigned to the softkeys. The softkeys on the NetLink e340/i640 emulate the softkeys on the Cisco 7960 deskset.



If an Open Application Interface (OAI) is operational, a function key sequence will be assigned in the OAI configuration. Any sequence(s) utilized by OAI will have priority in the Function display list. The other functions assigned to this list will appear in this order: Mute, Voicemail, speed dial numbers.

E.g. If OAI is assigned to **FCN 3** and **FCN 6**, then Mute will be **FCN 1**, Voicemail will be **FCN 2**, and speed dial numbers will be **FCN 4, 5, 7, 8**, and so on.

7.2 Feature Access

All features are viewed with the handset off hook. Press the **Start Call** button to go off hook. To dial a call, you may use predialing by dialing the number and then pressing **Start Call** and selecting the line.

Line appearances

Press the **Line** key to view a list of available line appearances and their assigned extensions. To access a line and make a call, press the corresponding key. Press the **End Call** button to exit the Line Appearance list.

Speed dial, Mute, Voicemail and OAI

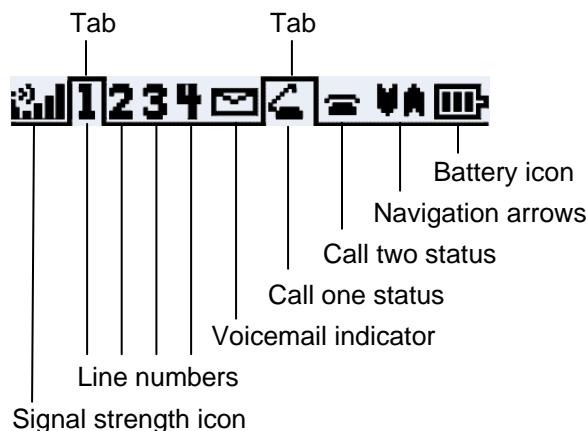
Press the **FCN** key while off hook to display the Mute, Voicemail and OAI features and the first four items in the speed dial list. Activate the feature by pressing the corresponding key as shown on the display or by pressing the shortcut key. Press **FCN** again to scroll through the programmed features. Press the **End Call** button to exit the Function list.

Features

Whenever the handset is active, the softkey abbreviations display. Each feature abbreviation is shown above the corresponding softkey. Pressing the feature's corresponding softkey or pressing the **MENU** key plus the shortcut key will activate the feature. Press the **MENU** key for an expanded description of the softkey features. Use the side buttons (**Up**, **Select**, **Down**) to scroll through the features. The **Select** button will activate the selected feature. Pressing the softkey or shortcut key will activate the feature even if it is not selected or shown on the **MENU** display. Press the **More** softkey to display the next set of programmed features. Press the **End Call** button to exit the Feature list.

Call handling

In order to accommodate four line appearances with two possible calls on each, the handset display has been modified. The top row displays the signal strength icon, the four line appearance numbers, the voicemail indicator (replaced by the downloader icon when the handset is downloading code), a call status icon for each call, navigation arrows, and the battery icon as shown below:



The tabs indicate which line and which call is active. In the above display, line one is in an active call. The second call for line one is on hook.

Call status icons have the following states:

Call Status Icon	Call State	Description
	On Hook	The line is not in use.
	Off Hook	The line is in use. There is a dial tone or there is an active call.
	Hold	The call has been placed on hold.
	Incoming call ringing. Icons flash through three views.	The line is ringing.
	Outgoing call, ringing. Icons flash between two views.	An outgoing call is ringing on the called party's line.
	Shared line is in use. Icons flash between two views.	The shared line is in use by another party and is not available for incoming or outgoing calls.

Two calls per line

The handset supports two calls per line. Call icons display the status of each call to help you keep track of the calls.

If you want to...	Then...
Make a second call on the same line	<p>Press the Hold softkey to put the current call on hold.</p> <p>Press the Select button to switch to the second call. The tab moves to the second call icon, which is on-hook.</p> <p>Press the Nwcl softkey. A dialtone is heard and the off-hook icon displays.</p> <p>Dial the number. The outgoing call icon displays. The handset display shows the information for the called party.</p>
Answer a second call on the same line	<p>The incoming call icon displays for the second call and there is a soft ringing in the ear.</p> <p>Press the Hold softkey to put the current call on hold.</p> <p>Press the Select button to switch to the second call. The tab moves to the second call and caller information is displayed on the handset.</p> <p>The handset automatically answers the second call. Simply speak into the handset.</p>
Return to the first call	<p>Press the Hold softkey to put the second call on hold.</p> <p>Press the Select button to return to the first call. The tab moves to the first call icon and the hold icon is displayed. The handset displays information about the first call.</p> <p>Press the Resume softkey to activate the call.</p>
End the first call and resume the second call	<p>Press the End Call key. The first call terminates and the on-hook icon displays.</p> <p>Press the Select button. The tab moves to the second call and the call is automatically resumed.</p>

8. Testing a Handset

Verify proper registration and operation of each handset by performing the following tests on each handset in an active wireless area.

1. Power on the handset by pressing **Power On**. You will see a series of messages displayed as the handset acquires the system. The handset should display the user extension or dashes if no extension is programmed. Any error messages should clear.
2. Press the **Start Call** key. The extension number should be replaced by information from the CallManager and you should hear dial tone. Place a call and listen to the audio quality. End the call by pressing the **End Call** key.
3. Place a call to the handset and verify ring, answer, clear transmit, and clear receive audio.
4. Go off-hook and use the **FCN** key to verify the Features list.
5. Go off-hook and use the **LINE** key to verify the Line appearances / Line features list.
6. Press the **End Call** key. Any line indicators should turn off and the extension number display will return.

9. Diagnostic Tools

Run Site Survey, Diagnostic Mode and **Syslog Mode** are three diagnostic tools provided to assist the WLAN administrator in evaluating the functioning of the NetLink Wireless Telephone and the system surrounding it. Diagnostic Tools are enabled in the Admin menu.

9.1 Run Site Survey

Site Survey is used to evaluate the facility coverage before certifying that an installation is complete. It can also be used at any time to evaluate coverage by testing signal strength, to gain information about an AP, and to scan an area to look for all APs regardless of ESSID. The information available through site survey includes:

- ESSID
- Beacon Interval
- Information regarding support of 802.11d, 802.11g, 802.11h, and other 802.11 amendment standards as required.
- Current security configuration

Start the site survey by selecting **Run Site Survey** from the Admin menu. The mode starts immediately.

When the test is started, it is by default in “single ESSID” mode. When the **Any** soft key is pressed (softkey A), all APs, regardless of ESSID are displayed, and the softkey changes to say **MyID**. Pressing the **MyID** soft key will revert to the “single ESSID” mode and change the softkey back to **Any**.

The display would look like the following for the multiple AP mode.

1 1 1 1 1 1	-	2 2	3 3	4 4 4
1 1 1 1 1 1	-	2 2	3 3	4 4 4
1 1 1 1 1 1	-	2 2	3 3	4 4 4
1 1 1 1 1 1	-	2 2	3 3	4 4 4
A n y				D e t l

Where:

- 111111 = The last three octets of the on-air MAC address for a discovered AP.
- 22 = The signal strength for the specified AP.
- 33 = The channel number of the specified AP.
- 444 = The beacon interval configured on the specified AP.
- Any/MyID = Softkey to toggle between “single ESSID” and “any ESSID” mode.
- Detl/Smry = Softkey to toggle between the multiple AP (summary) display, and the single (detail) displays for each AP.

The following screen shows how the display would look when there are three APs configured with an ESSID that matches that of the handset. The first has a signal strength of -28dbm, is configured on channel 2, with a beacon interval of 100ms. The second has a signal strength of -48dbm, is configured on channel 6, with a

beacon interval of 200ms. The third has a signal strength of –56dbm, is configured on channel 11 with a beacon interval of 100ms.

a b 7 b c 8	- 2 8	0 2	1 0 0
2 a e 5 7 8	- 4 8	0 6	2 0 0
2 a e 5 9 6	- 5 6	1 1	1 0 0
A n y		D e t l	

When the any ESSID mode is selected, the summary display contains the first six characters of the APs ESSID instead of the beacon interval as in the example below.

a b 7 b	- 2 8	0 2	A L P H A
2 a e 5	- 4 8	0 6	W S M T E S
2 a e 5	- 5 6	1 1	v o i c e
M y I D		D e t l	

In detail mode the display would appear as follows. The Left/Right arrow keys will move between AP indices.

i : b b b b b b	s n	c h	b c n
e e e e e e e e e e		D G H I	
r r r r r r r r r r r r	+ x x x x		
m m m G : g g g g	P : p p p p		
A n y		S m r y	

Where:

- i = Index of selected AP (value will be from 0 to 3 inclusive)
- bbbbbbb = The last three octets of the BSSID for a discovered AP.
- sn = Signal strength in –dbm
- ch = Channel
- bcn = Beacon interval
- eeeeeeeeeee = ESSID (Up to first 11 characters)
- DGHI = Standards supported
- rrrrrrrr = Rates supported. Basic rates will have a “b” following the rate.
- + = more rates are supported than those displayed
- xxxx = WMM or UPSD if those QoS methods are supported
- mmm = Security mode
- G:gggg = Group key security
- P:pppp = Pairwise key security
- Any/MyID = Softkey to toggle between “single ESSID” and “any ESSID” modes.
- Detl/Smry = Softkey to toggle between the multiple AP display (summary), and the single AP display (detail).

Numbers racing across the handset display indicate AP information is being obtained. A **Waiting** message indicates the system is not configured properly and the handset cannot find any APs.

Solving coverage issues

Coverage issues are best resolved by adding and/or relocating APs.

Overlap issues may be resolved by reassigning channels to the APs or by relocating the APs. See the *Troubleshooting* section *Access Point Problems* for more information.

9.2 Diagnostics Mode

The Diagnostics Mode is used to evaluate the overall quality of the link between the handset, AP, and infrastructure side equipment, such as Call Agent, NetLink SVP Server, and gateways. Unlike Site Survey, the Diagnostics Mode is used while the functional code is running, and during a call.

When **Diagnostics Mode** is turned on in the Admin menu, the handset can display diagnostic screens any time it is active (in a call).

The display of information is instigated by pressing the **MENU** key. Only four of the diagnostic counters listed below can be shown at a time. Pressing the **MENU** key multiple times will cycle through the various counters and the normal off hook (Call Agent) display. The numeric icon at the top of the display indicates what screen number is being displayed. For example the first time the **MENU** key is pressed, the **1** icon is shown, and the first four counters are displayed, the next time it is pressed, the **2** icon is shown, and the next four counters are displayed, the counters will be cycled through in this fashion until there are no more counters to be displayed. After all the counters have been displayed, the screen returns to the normal off hook Call Agent screen.

Note that the normal use of the **MENU** key is not available if **Diagnostics Mode** is enabled.

The information provided by the Diagnostics Mode includes:

Screen 1

- Missed receive packet count since power up (MissedRcvCnt)
- Missed transmit packet count since power up (MissedXmtCnt)
- Receive retry count since power up (RxRetryCount)
- Transmit retry count since power up (TxRetryCount)

M i s s e d R c v C n t	n n n n n
M i s s e d X m t C n t	n n n n n
R x R e t r y C o u n t	n n n n n
T x R e t r y C o u n t	n n n n n

Screen 2

- Jitter (Jitter), average error or “wobble” in received packet timing, in microseconds
- Last successful transmit data rate (LastRate)
- Gateway type (GatewayType)

Jitter	n n n n n
Last Rate	n n n n n
Gateway Type	m n e m o

Where:

- mnemo: A mnemonic that indicates what type of gateway is being used
- SawA2: All handsets are rate limited to 2Mb because a 500 series NetLink handset is on the network.
- 2Mb: non-NetLink SVP Server Gateway system (handsets are limited to 2Mb if the NetLink SVP Server is not used.)
- 11Mb: Gateway with NetLink SVP Server and no 500 series NetLink Wireless Telephones. This system can run at the full 11Mb/s speed.

Screen 3

Screen 3 contains a list of the APs that are heard and the following parameters from each AP:

- Indicator as to whether this is the current AP or an index into the list of other APs heard
- Last 2 octets of the MAC address of the AP
- Channel number
- Signal strength
- Either the 802.11 Association ID from the current AP or a mnemonic for the reason code indicating why the handset didn't hand off to this other AP.

C :	m m m m	c h	- s s	a i d
1 :	m m m m	c h	- s s	m n e m
2 :	m m m m	c h	- s s	m n e m
3 :	m m m m	c h	- s s	m n e m

Where:

- C: Indicates the AP that the handset is currently using
- n: Indicates an index into the list of other APs, where n is equal to 1, 2, or 3
- mmmm: This hexadecimal number is the last 2 octets of this AP's MAC address
- ch: Channel number the AP is configured on
- -ss: Signal strength for the AP in dBm
- aid: The Association ID for the currently associated AP

- mnem: A mnemonic that indicates why the handset didn't hand off to this other AP:
Unkn: Reason unknown
Weak: Signal Strength too weak
Rate: One or more basic rates not supported
Full: AP can not handle bandwidth requirements
AthT: Authentication Timeout
AscT: Association Timeout
AthF: Authentication Failure
AscF: Association Failure
SecT: Security Handshake Timeout
SecF: Security Handshake Failure
Cnfg: AP not configured correctly for security, QoS mode or infrastructure network.

Screen 4

- Association count since power up (AssocCount)
- Re-association count since power up (ReAssocCount)
- Association failures since power up (AssocFailure)
- Re-association failures since power up (ReAssocFail)

A s s o c C o u n t	n n n n n
R e A s s o c C o u n t	n n n n n
A s s o c F a i l u r e	n n n n n
R e A s s o c F a i l	n n n n n

Screen 5

- Security error count since power up (Sec-ErrCount)
- MAC sequence number of frame with last security error (LstSecErrSeq)

S e c - E r r C o u n t	n n n n n
L s t S e c E r r S e q	n n n n n

9.3 Syslog Mode

A syslog server must be present on the network in order for the handset to send the log messages and have them saved. The syslog server will be found with DHCP option 7 if the handset is using DHCP. If static addresses are configured, the syslog server's IP address can be configured statically in the Admin menu.



If the syslog server address is blank (000.000.000.000 or 255.255.255.255) or the handset is using DHCP and no option 7 is received from the DHCP server, the handset will not send any syslog messages.

Admin menu options:

- ***Disabled** turns syslog off.
- **Errors** causes the handset to log only events that we consider to be an error (see below).
- **Events** logs all errors plus also some other interesting events (see below).
- **Full** logs all the above plus a running stream of other quality information (see below).

The table below lists the syslog messages and which level of logging will produce them:

Message type	Errors	Events	Full
Failed Handoff	Yes	Yes	Yes
Successful Handoff	No	Yes	Yes
Security Error	Yes	Yes	Yes
Call Start/End	No	Yes	Yes
Audio stats	No	No	Yes (every 5 secs)
Audio error threshold exceeded	Yes	Yes	Yes
Radio stats	No	No	Yes (every 5 secs)
Radio error threshold exceeded	Yes	Yes	Yes

All syslog messages will include:

- Date and time (to 1/100th of second) since handset power on (currently set to Jan-1 00:00.00)
- Handset's MAC address
- Handset's IP address
- Sequence number

The table below lists the additional items in each Message type:

Failed Handoff (Sent whenever the handset attempted to handoff, but failed trying.)	Failed AP MAC Failed AP signal strength Current AP MAC Current AP signal strength Failure reason
--	--

Successful Handoff	New AP MAC New AP signal strength Old AP MAC Old AP signal strength Reason for handoff Other candidate APs: MAC Signal strength Reason not used
Security Error	AP MAC AP signal strength Security mode Error details (mode dependent)
Call Start	Call type (telephony, OAI, PTT) AP MAC AP signal strength
Call End	AP MAC AP signal strength
Audio stats	AP MAC AP signal strength Payload size (in msec) Payloads sent Payloads received Payloads missed (not received) Payloads missed rate (over last 5 seconds) Payloads late Payloads late rate (over last 5 seconds) Average jitter
Audio error threshold exceeded (Sent if payloads missed rate or payloads late rate exceeds 2%, or if the average jitter is over 2 msec)	Same as audio stats
Radio stats	AP MAC AP signal strength Directed packets sent Directed packets received Multicast packets sent Multicast packets received Broadcast packets sent Broadcast packets received TX dropped count TX drop rate (over last 5 seconds) TX retry count TX retry rate (over last 5 seconds) RX retry count RX retry rate (over last 5 seconds)
Radio error threshold exceeded (Sent if TX drop rate exceeds 2% or TX or RX retry rate exceeds 5%)	Same as radio stats

Messages are formatted like the following example:

```
Jan 1 00:01:26.72 0090.7a02.2a1b (172.16.0.46) [001a] RStat: AP 00:40:96:48:1D:0C (-56 dBm),
Sent 783523, Recvd 791342, MSnt 245, MRcd 5674, BSnt 43, BRcd 10783, TX drop 43 (0.0%), TX retry
578 (1.2%), RX retry 1217 (1.6%)
```

10. Certifying the NetLink Wireless Telephones

Prior to determining that an installation is complete, test the handsets following the sequence given in the previous *Testing a NetLink Wireless Telephone* section and conduct a site survey mode test according to the directions given in the previous *Diagnostic Tools* section. Note any areas where coverage is conflicting or inadequate. Note any system difficulties and work with your wireless LAN and/or LAN system administrator to determine the cause and possible remedy. See the section *NetLink Wireless Telephone Problems* for clues to possible sources of difficulties. If any adjustments are made to the system, re-test the device in the same vicinity to determine if the difficulty is resolved.

The installer should not leave the site before performing installation verification.

These tests must be performed in typical operating conditions, especially if heavy loads occur. Testing sequence and procedure is different for every installation. Generally, you should organize the test according to area and volume, placing numerous calls to others who can listen while you perform coverage tests. Note any areas with excessive static or clarity problems and report it to a SpectraLink service engineer.

The coverage test will also require you to put the handset in **Site Survey** mode and walk the entire coverage area to verify all APs.

10.1 Conducting a Site Survey

Conduct a Site Survey of the installation, by walking the site looking for interfering 802.11 systems, adequate coverage and channel assignment, and correct AP configuration.

1. Referring to section 6.1 *Run Site Survey*, put a handset into Site Survey in the **Any/Smry** ESSID mode. Walk throughout the site checking for any expected APs or other ESSIDs.
2. Then, walk the site again, in **MyID/Smry** ESSID mode, this time checking that every location has adequate coverage (there should be at least one AP stronger than -70dBm in all areas) and has good channel allocation (at any point, the strongest AP shown should be on a different channel than the next best choice).
3. Finally, use the single AP (**MyID/Detl**) display to check each AP, to ensure it is configured for the proper data rates, beacon interval, 802.11 options enabled, QoS method, and security method.
4. Make any necessary adjustments to AP locations and configurations and repeat steps 1-3 until the Site Survey shows adequate coverage and correct configuration at every location.

The installation is not complete until these certification steps have been performed. Do not hand out handsets at a site that has not been certified.

11. Software Maintenance

The NetLink e340/i640 Wireless Telephones use proprietary software programs written and maintained by SpectraLink Corporation. The software versions that are running on the handsets can be displayed during power on by holding down the **Power On** button.

SpectraLink or its authorized dealer will provide information about software updates and how to obtain the software.

Downloads are available from

<http://www.polycom.com/usa/en/support/voice/wi-fi/wi-fi.html>.

11.1 Upgrading NetLink Wireless Telephones

After software updates are obtained from SpectraLink, they must be transferred to the appropriate location in the LAN to update the code used by the handsets.

NetLink e340/i640 Wireless Telephones allow over-the-air transfer of software updates from the designated TFTP server to the handsets. The downloader function in the handset checks its software version every time the handset is turned on. If there is any discrepancy the handset immediately begins to download the update.

Normal download messages

When the handset is powered on, it displays a series of messages indicating that it is searching for new software, checking the versions, and downloading. The normal message progression is:

Message	Description
Checking Code	Handset is contacting the TFTP server to determine if it has a newer version of software that should be downloaded.
Erasing Memory	Handset has determined that a download should occur and is erasing the current software from memory. This message also displays a progress bar. When the progress bar fills the display line the erase operation is complete.
Updating Code	Handset is downloading new software into memory. The number icons at the bottom of the display indicate which file number is currently being downloaded. This message also displays a progress bar. When the progress bar fills the display line the update operation is complete on that file.

When the update is complete, the handset displays the extension number, and is ready for use.

Download failure or recovery messages

The following display messages indicate a failure or recovery situation during the download process.

Message	Description
Server Busy	Handset is attempting to download from a TFTP server that is busy downloading other phones and refusing additional downloads. The handset will automatically retry the download every few seconds.
TFTP ERROR(x):yy	A failure has occurred during the TFTP download of one of the files. (x) = The file number which was being downloaded; yy is an error code describing the particular failure. Possible error codes are: 01 = TFTP server did not find the requested file. 02 = Access violation (reported from TFTP server). 07 = TFTP server reported "No such user" error. Check the TFTP server configuration. 16 = No TFTP server address. Check the TFTP server configuration. 81 = File put into memory did not CRC. The handset will attempt to download the file again. FF = Timeout error. TFTP server did not respond within a specified period of time.
Erase Failed	Download process failed to erase the memory in the handset. This operation will retry.
Waiting	Handset has attempted some operation several times and failed, and is now waiting for a period of time before attempting that operation again.

12. Troubleshooting NetLink Wireless Telephone Problems

NetLink Wireless Telephones can exhibit transmission problems in several ways. They can cease functioning properly, display error messages, or display incorrect data. When using and troubleshooting handsets, consider the following problem sources to determine the best method of approaching any specific situation.

12.1 Access Point Problems

Most, but not all, handset audio problems have to do with AP range, positioning and capacity. Performing a Site Survey as described in this document can isolate the AP causing these types of problems. If the handset itself is suspected, conduct a parallel Site Survey with a handset that is known to be properly functioning.

In range/Out of range Service will be disrupted if a user moves outside the area covered by the wireless LAN APs. Service is restored if the user moves back within range. If a call drops because a user moves out of range, the handset will recover the call if the user moves back into range within a few seconds.

Capacity In areas of heavy use, the call capacity of a particular AP may be filled. If this happens, the user will hear three chirps from the handset. The user can wait until another user terminates a call, or move within range of another AP and try the call again. If a user is on a call and moves into an area where capacity is full, the system attempts to find another AP. Due to range limitations, this may be the same as moving out of range.

Transmission Obstructions Prior to system installation, the best location for APs for optimum transmission coverage was determined. However, small pockets of obstruction may still be present, or obstructions may be introduced into the facility after system installation. This loss of service can be restored by moving out of the obstructed area, or by adding APs.

12.2 Configuration Problems

Certain problems are associated with improper configuration of either the CallManager or the handset.

Configuration problems are generally corrected by changing the configuration at the CallManager or on the Wireless Telephone. There may also be incorrect programming of the AP. See the *Configuration Guide* for the AP in use at the site. Configuration guides are available from

http://www.polycom.com/usa/en/support/voice/wi-fi/wi_fi_interoperability.html.

If CallManager registration fails, note any error messages on the display including which line icons are active. This information will help with the problem resolution.

12.3 NetLink Wireless Telephone Status Messages

NetLink Wireless Telephone status messages provide information about the NetLink e340/i640 Wireless Telephone's communication with the AP and host telephone system. The following table summarizes the status messages, in alphabetical order.

Message	Description	Action
3 chirps	Handset is not able to communicate with the best AP, probably because that AP has no bandwidth available.	None. This is only a warning, the call will handoff to the best AP once it becomes available.
Address Mismatch	Handset software download files are incorrect or corrupted	Download new software from the SpectraLink site per <i>Software Maintenance</i> .
ASSERTxxx.c Line yyy	The handset has detected a fault from which it cannot recover.	Record the error code so it can be reported. Turn the handset off then on again. If error persists, try registering a different handset to this telephone port. If error still persists, contact Avaya Technical Support and report the error.
Assoc Failed xxxxxxxxxx	x...x = AP MAC address Handset association was refused by AP; displays MAC of failing AP.	Check handset and AP security settings. Ensure AP is configured per <i>Configuration Guide</i> . Try another AP.
Assoc Timeout xxxxxxxxxx	x...x = AP MAC address Handset did not receive association response from AP; displays MAC of failing AP	Check handset and AP security settings. Ensure AP is configured per <i>Configuration Guide</i> . Try another AP.
Auth Failed xxxxxxxxxx	x...x = AP MAC address Handset authentication was refused by AP; displays MAC of failing AP	Check handset and AP security settings. Ensure AP is configured per <i>Configuration Guide</i> . Try another AP.
Auth Timeout xxxxxxxxxx	x...x = AP MAC address Handset did not receive authentication response from AP; displays MAC of failing AP	Check handset and AP security settings. Ensure AP is configured per <i>Configuration Guide</i> . Try another AP.
Bad Code Type xx Expected Code Type yy	xx, yy = software licence types Handset software does not match current handset license selection	Download new software from the SpectraLink site per <i>Software Maintenance</i> .
Bad Config	Some needed configuration parameter has not been set	Check all required handset configuration parameters for valid settings
Bad ESSID	The handset is configured for "static ESSID" (as opposed to "Learn once" or "Learn always" and no ESS ID has been entered.	Enter an ESSID in the configuration settings or change to one of the "Learn" modes.
Bad Phintl File	Handset software download files are incorrect or corrupted	Download new software from the SpectraLink site per <i>Software Maintenance</i> .
Bad Program File	Handset software download files are incorrect or corrupted	Download new software from the SpectraLink site per <i>Software Maintenance</i> .

Message	Description	Action
(battery icon), Battery Low beep (audio)	Low battery	<p>In call: the battery icon displays and a soft beep will be heard when the user is on the handset and the battery charge is low. User has 15–30 minutes of battery life left.</p> <p>The Battery Pack can be changed while the call is still in progress. Do not press Power Off/End Call. Place call on Hold or Park. Quickly remove the discharged battery and replace with a charged battery, power on the handset, and press Power On/Start Call to resume the call in progress.</p> <p>Not in call: The battery icon displays whenever the battery charge is low. The message Low Battery and a beep indicate a critically low battery charge when user is not on the handset. The handset will not work until the Battery Pack is charged.</p>
Battery Failure	The Battery Pack is not functioning.	Replace the Battery Pack with a new or confirmed SpectraLink Battery Pack. Any non-Spectra-Link Battery Packs will not work.
Battery Failed	Battery Pack is damaged or incompatible with handset.	Replace the Battery Pack with a new or confirmed SpectraLink Battery pack. Any non-SpectraLink Battery Packs will not work.
Cannot DNS CMgr	A CallManager has been specified by name when the handset has been configured for static IP operation.	Change configuration file on CallManager to use IP Address rather than names.
Can't Renew DHCP	The functional code is not able to get a lease renewal.	Configuration problem. Check the IP address configuration in the DHCP server.
Charging ...	The handset is charging in the Desktop Charger	No action needed
Charge Complete	The handset is now fully charged	No action needed
Checking Code	Handset is contacting the TFTP server to determine if it has a newer version of software that should be downloaded.	None, this message should only last for approximately one second. If message remains displayed, power off and contact SpectraLink customer support.
Checking DHCP IP	The handset is retrieving DHCP information from the DHCP server	None. This is informational only.
CRC Code Error	The software which has been TFTP downloaded has a bad redundancy code check	Try the download again, it is possible the software was corrupted during download. If the error repeats, check that the download image on the TFTP server is not corrupted.
Code Mismatch!	The software loaded into the handset is incorrect for this model handset	Replace the software image on the TFTP server with software that is correct for the handset model.

Message	Description	Action
DCA Timeout	The handset has detected a fault for which it cannot recover, possibly due to a failure to acquire any network.	Turn the handset off then on again. If error persists, contact SpectraLink Technical Support and report the error.
DHCP Error (1-4)	DHCP Error 1	The handset cannot locate a DHCP server. It will try every 4 seconds until a server is located.
	DHCP Error 2	The handset has not received a response from the server for a request to an IP Address. It will retry until a server is found.
	DHCP Error 3	The server refuses to lease the handset an IP Address. It will keep trying.
	DHCP Error 4	The server offered the handset a lease that is too short. The minimum lease time is 10 minutes but SpectraLink engineers recommend at least one hour minimum lease time. The handset will stop trying. Reconfigure the server and power cycle the handset.
	DHCP Error 5	Failure during WEP Key rotation process (proprietary feature).
DHCP Lease Exp	The handset's DHCP lease has expired, and the call (if any) cannot continue.	The handset failed to renew its DHCP lease, either because the DHCP server is not running, or because the configuration has been changed by the administrator. The handset will attempt to negotiate a new lease, which will either work, or change to one of the above DHCP errors (1-4).
DHCP NACK error	A NACK (Negative ACKnowledge) was received from the DHCP server	The DHCP lease currently in use by the handset is no longer valid, which forces the handset to restart. This problem should resolve itself on the restart. If it does not, the problem is in the DHCP server.
DL Not on Sector	Handset software download files are incorrect or corrupted	Download new software from the SpectraLink site per Software Maintenance.
DO NOT POWER OFF	The handset is in a critical section of the software update	None. Do not remove the Battery Pack or attempt to power off the handset while this is displayed. Doing so may require the handset to be returned to SpectraLink to be recovered.
Duplicate IP	The handset has detected another device with its same IP Address	If using DHCP, check that the DHCP server is properly configured to avoid duplicate addresses. If using Static IP, check that the handset was assigned a unique address

Message	Description	Action
Erase Failed	Download process failed to erase the memory in the handset.	Operation will retry but may eventually report the error "int. error: OF" Power cycle the handset.
Erasing Memory	Handset has determined that a download should occur and is erasing the current software from memory.	None. When the progress bar fills the display line the erase operation is complete.
Files Too Big	Handset software download files are incorrect or corrupted	Download new software from the SpectraLink site per <i>Software Maintenance</i> .
Flash Config error	Handset internal configuration is corrupt.	Perform "Restore Defaults" operation via administrator menus [or reprogram with Configuration Cradle].
H225 Listen Fail ?	Handset cannot communicate with the AP or the SVP Server	This message may display with another diagnostic message. Follow diagnostic actions for the second message (such as No Net Found).
H245 Listen Fail ?	Handset cannot communicate with the AP or the SVP Server	This message may display with another diagnostic message. Follow diagnostic actions for the second message (such as No Net Found).
Initializing ...	The handset is performing power on initialization	None. This is informational only.
Internal Err. # # (also int. error, user error;, undef error)	The handset has detected a fault from which it cannot recover. OE = Error while writing the Flash (return Wireless Telephone to factory) OF = No functional code (Contact SpectraLink Technical Support)	Record the error code so it can be reported. Turn the handset off then on again. If error persists, try registering a different handset to this telephone port. If error still persists, contact SpectraLink Technical Support and report the error.
Must Upgrade SW!	Handset software is incompatible with hardware.	Download new software from the SpectraLink site per <i>Software Maintenance</i> .
Net Busy xxxxxxxxxx	x...x = AP MAC address Handset cannot obtain sufficient bandwidth to support a call; displays MAC of failing AP.	Try the call again later.
No CallMgr Found	Phone not registered on CallManager CallManager is not working No LAN connection at the AP or CallManager Handset can't locate CallManager	Verify that CallManager is properly configured. Verify that CallManager is operational. If so, follow standard CallManager troubleshooting procedures. Verify CallManager connection to LAN and all APs. IP Address configuration of Cisco TFTP is wrong or missing.
No DHCP Server	Handset is unable to contact the DHCP server.	Check that DNCP is operational and connected to WLAN or use Static IP configuration in the handset.

Message	Description	Action
No ESSID	Attempted to run site survey application without an ESSID set.	Let handset come completely up. Statically configure an ESSID in the Admin menu.
No Func Code	Handset software download files are incorrect or corrupted	Reconfigure the handset to gain access to the WLAN and download new code.
No Host IP	The handset is configured for "static IP" (as opposed to "use DHCP") and no valid host IP Address (the handset's IP Address) has been entered.	Enter a valid IP Address in the configuration settings or change to "use DHCP".
No IP Address	Invalid IP	Check the IP Address of the handset and re-configure if required.
No SVP IP	The handset is configured for "static IP" (as opposed to "use DHCP") and no valid NetLink SVP Server address has been entered.	Enter a valid NetLink SVP server IP Address in the configuration setting or change to "use DHCP."
No SVP Response yyy.yyy.yyy.yyy	y...y = SVP Server IP address Handset has lost contact with the SVP Server.	This may be caused by bad radio reception or a problem with the NetLink SVP Server. The handset will keep trying to fix the problem for 20 seconds, and the message may clear by itself. If it does not, the handset will restart. Report this problem to the system administrator if it keeps happening.
No SVP Server	Handset can't locate SVP Server SVP Server is not working No LAN connection at the SVP Server	IP Address configuration of NetLink SVP Server is wrong or missing. Check error status screen on NetLink SVP Server. Verify NetLink SVP Server connection to LAN.
No Net Access	Cannot authenticate / associate with AP	Verify the AP configuration.
No Net Found	This indicates any of the following: No radio link No ESSID – Autolearn not supported (or) Incorrect ESSID Out of range	Verify that the AP is turned on. Verify the ESSID of the wireless LAN and enter or Autolearn it again if required. Try getting closer to an AP. Check to see if other handsets are working within the same range of an AP. If so, check the ESSID of this handset.
	Incorrect WEP settings Incorrect Security settings	Verify that all the WEP settings in the handset match those in the APs. Verify that all the Security settings in the handset match those in the APs.

Message	Description	Action
No Net Found xxxxxxxxxx yy	x...x = AP MAC address yy = AP signal strength Handset cannot find a suitable AP; displays MAC and signal strength of “best” non-suitable AP found.	Check AP and handset network settings such as ESSID, Security, Reg domain and Tx power. Ensure APs are configured per <i>Configuration Guide</i> . Try Site Survey mode to determine more specific cause.
No Reg Domain	Regulatory Domain not set	Configure the Regulatory Domain of the handset
No SW Found	A required software component has not been properly identified.	Check that the handset license type has a corresponding entry in the slnk_cfg.cfg file. Check that the pd11skd.bin and pi10001.bin entries exist under this license type in the slnk.cfg.cfg file.
Not Installed!	A required software component is missing	Check that all required software files are on the TFTP server, if over-the-air downloading is being used. If the error repeats, contact SpectraLink Technical Support.
Press End Call	Your call has ended	Press the End Call key to return to standby mode.
Restarting	The handset is in the process of rebooting. There will be a 20 second delay in an attempt to let potential network/system errors clear.	None
Select License	The correct protocol has not been selected from the license set.	Using the administrative menus, select one license from the set to allow the handset to download the appropriate software.
Server Busy	Handset is attempting to download from a TFTP server that is busy downloading other devices and refusing additional downloads.	None, the handset will automatically retry the download every few seconds.
SKT Open Failed	Socket open fail. Occurs when the handset tries to connect to the PBX but there is no response. If resiliency is active, the handset will keep trying.	If the PBX is inoperative and resiliency is not active or the handset cannot locate a backup PBX, turn off the handset and repair the primary PBX. Note that it may be advisable to reconfigure the backup PBX to be the primary PBX if the repair is more time-consuming than the reconfiguration.
Storing Config	Handset is storing changes to handset configuration.	None. Informational only. The handset may display this briefly following a configuration change or software download.
SVP Service Rej.	The NetLink SVP Server has rejected a request from the handset	The handset will restart and attempt to re-register with the SVP Server, which should fix the problem. Report to your administrator if it keeps happening.
System Busy yyy.yyy.yyy.yyy	y...y = SVP Server IP Address SVP Server has reached call capacity.	All call paths are in use, try the call again in a few minutes.

Message	Description	Action
System Locked (with Busy Tone)	NetLink SVP Server is locked	Try call again later, system has been locked for maintenance
TFTP ERROR(x):yy	<p>A failure has occurred during a TFTP software download. (x) is the file number which was being downloaded; yy is an error code describing the particular failure. Possible error codes are:</p> <p>01 = TFTP server did not find the requested file.</p> <p>02 = Access violation (reported from TFTP server).</p> <p>07 = TFTP server reported "No such user" error.</p> <p>16 = No TFTP server address</p> <p>81 = File put into memory did not CRC.</p> <p>FF = Timeout error. TFTP server did not respond within a specified period of time.</p>	<p>Error code 01, 02, 07 or 16 – check the TFTP server configuration.</p> <p>Error code 81, the handset will attempt to download the file again.</p> <p>For other messages, power off the handset, then turn it on again to retry the download. If the error repeats, note it and contact SpectraLink Technical Support.</p>
Too Many Errors	The handset continues to reset and cannot be recovered.	Fatal error. Return handset to SpectraLink.
Unknown xx:yy:zz	A phrase is missing from your phintl file.	Download new software from the SpectraLink site per <i>Software Maintenance</i> .
Updating Code...	Handset is downloading new software into memory.	None. When the progress bar fills the display line the update operation is complete on that file.
Updating ...	The handset is internally updating its software images	None. The handset may do this briefly after a download. This is informational only.
Waiting...	Handset has attempted some operation several times and failed	None. The handset is waiting for a specified period of time before attempting that operation again.
Wrong Code Type	Internal consistency check failure.	Assure that the license type is set to 9, and that the slnk_cfg.cfg file indicates the proper code is pd11ccc.bin.

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